INSTRUCTION MANUAL

REGULATED POWER SUPPLIES

MODEL

LND-W-152

SH 10/622

Electronic Services - Los Angeles
M13481X

MP MASTER
MA28809

LAMBDA

LAMBDA ELECTRONICS MELVILLE, L. I., N. Y.

INSTRUCTION MANUAL

FOR

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SN# 101622

(1)

This manual provides instructions intended for the operation of Lambda power supplies, and is not to be reproduced without the written consent of Lambda Electronics. All information contained herein applies to model LND-W-152.

LAMBDA ELECTRONICS MELVILLE, L.I., N.Y.

MAIN PLANT TELEPHONE: 516 MYrtle 4-4200

IM-LND-W

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SPECIFICATIONS AND FEATURES

D. C. OUTPUT — Voltage regulated for line and load. See table I for voltage and current ratings.

TABLE I

VOLTAGE RANGE	MAXIMUM CURRENT (AMPS) AT AMBIENT TEMPERATURE*			
	40°C	50°C	60°C	71°C
±12	3.1	2.8	2.3	1.6
±15	3.3	3.1	2.6	2.0

Current range must be chosen to suit the appropriate maximum ambient temperature.
See below for current ratings at different output voltages.
*Ratings apply for use with cover removed. Derate current 10% for each ambient temperature if cover is used. Refer to figure 8 for cover removal.

DETERMINATION OF CURRENT RATINGS AT OUTPUT VOLTAGES BETWEEN ±12 AND ±15 VOLTS — Current ratings vary linearly with output voltages. To determine current for any given output voltage (between rated limits) proceed as follows:

1. Determine operating ambient temperature.
2. Find constants (see formula) m and c in table II below.
3. Apply current formula:

$$Io = mVo + c$$

where Io = output current, m = constant (see table II), c = constant (see table II), and Vo = desired output voltage; determine output current.

TABLE II

40°C		50°C		60°C		71°C	
m	c	m	c	m	c	m	c
0.067	2.3	0.10	1.6	0.10	1.1	0.133	0

REGULATED VOLTAGE OUTPUT (each side)

Regulation (line) . . . . . 0.1% for input variations from 105-127, 127-105, 210-254, or 254-210 volts AC.

Regulation (load) . . . . . .0.1% for load variations from no load to full load or full load to no load.

Ripple and Noise . . . . . 1.5 millivolts rms; 5 millivolts peak to peak.

Temperature Coefficient . . . . . Output change in voltage 0.03%/°C.

Remote Sensing . . . . . Provision is made for remote sensing to eliminate effect of power output lead resistance on DC regulation.

OVERSHOOT — No overshoot under conditions of power turn-on, turn-off, or power failure.

AC INPUT — 105-127 or 210-254* volts AC at 47-440 Hz. Standard LND-W power supplies are factory wired for 105-127 volt input, but can be rewired for 210-254 volt input. See figure 5 and schematic diagram for rewiring of AC input. Input power **: 200 watts. Ratings apply for 57-63 Hz input. For 47-53 Hz or 63-440 Hz input consult factory.

*Certified by Canadian Standards Association for 210-250 volt input.

**With output located to full current rating and input voltage 127 volts AC, 60 Hz.

TRACKING — Absolute voltage difference of either negative or positive output from nominal within 3%; 0.2% change for all conditions of line, load, and temperature.

OVERLOAD PROTECTION

Thermal	Thermostat, resets automatically when over temperature condition is eliminated.
Electrical	Automatic electronic current limiting circuit, limits output current to a safe value. Automatic current limiting protects the load and power supply when external overloads and direct shorts occur.

INPUT AND OUTPUT CONNECTIONS — Refer to figure 8 for location.

AC input	Screw terminals on printed circuit board.
Ground	Terminal on transformer.
DC output	Screw terminals on printed circuit board.
Sensing	Turret terminals on printed circuit board.
Overvoltage Protector	Quick disconnect terminal on printed circuit board with mating connector attached.

OPERATING AMBIENT TEMPERATURE RANGE AND DUTY CYCLE — Continuous duty from 0°C to 71°C ambient with corresponding load current ratings for all modes of operation.

STORAGE TEMPERATURE — -55°C to +85°C.

FUNGUS — LND-W power supplies are fungus inert.

DC OUTPUT CONTROL — Screwdriver voltage adjust control permits adjustment of DC output voltage. Refer to figure 8 for location of control.

PHYSICAL DATA

Size	9" x 5" x 2-7/8" with cover in place 9" x 4-7/8" x 2-3/4" with cover removed
Weight	9 lbs. net; 9-1/2 lbs. shipping
Finish	Gray, FED. STD. 595 No. 26081.

MOUNTING — Three surfaces, two with tapped mounting holes and one with clearance mounting holes, can be utilized for mounting this unit. Refer to figure 8 for mounting details.

"J" OPTION — LND-W power supplies can be obtained for 90-110 VAC, 47-440 Hz input. Ratings apply for 57-63 Hz input. For 47-53 Hz or 63-440 Hz input consult factory.

ACCESSORIES

Overvoltage Protector	L-12-OV Series Overvoltage Protectors are available.

THEORY OF OPERATION

GENERAL

The text in this section refers to components associated with the plus (+) side of the power supply; however, the discussion is equally applicable to the minus (-) side which has similar components, except for potentiometer R10 which is only used on the (+) side.

The Lambda power supply consists of an AC input circuit and transformer; a bias supply consisting of an auxiliary rectifier and filter, and pre-regulator; a main regulator circuit consisting of the main rectifier and filter, a series regulator, voltage sensing network, current sensing resistor, voltage reference*, voltage and current comparators*, and amplifier*.

*This circuit element is part of integrated circuit (IC1) in the supply.

The circuit arrangement is shown in block diagram form, figure 6. The circuitry is discussed with reference to the block diagram and the schematic diagram.

FUNCTIONAL DESCRIPTION

Single phase input power is applied to transformer T1 through the input circuit which contains a thermostat to protect the supply against overheating.

The main rectifier, a full wave rectifier, provides the power which is filtered by capacitor C1, and then regulated via a series regulator and delivered to the output. Half-wave auxiliary rectifier CR3 provides voltage filtered by capacitor C2 for preregulator CR4. The reference element, powered by the preregulator, provides a reference voltage for the voltage comparator.

Constant voltage circuit operation is determined by changes in line or load which cause a change in one input to the voltage comparator through voltage dividers R9, R10, and R6. A second input to the comparator is a reference voltage developed in IC1. The comparator compares the output voltage change with the reference voltage resulting in an error signal at the output of the comparator.

The error signal from the comparator controls the voltage across series regulator Q1, which functions as the active regulating elements in the supply.

Current limit circuit operation is determined by changes in the load. The current comparator samples load current through current sensing resistor R7. When the voltage drop across R7 increases to a preset voltage reference determined by R4 and R5, the current comparator conducts. Thus, when the output current rating of the unit is exceeded, the current comparator conducts, decreasing the drive to Q1, resulting in an increase of voltage across the series regulator and a decrease of the output voltage, effectively limiting the output current to a safe value. The current limit value is determined by fixed resistors R4 and R5.

When operating conditions approach short circuit, the output voltage decreases. Since the voltage determined by R4 and R5 is proportional to the output voltage, when the output voltage decreases, the amplifier is biased into turn on at lower and lower load currents until output voltage decreases to zero and current decreases to a predetermined low value.

Voltage tracking of the slave section to the master section is accomplished as follows:

When the output voltage increases, voltage across R23 and R28 also increases, causing an increase in one input to comparator located in IC21. The comparator compares this change with the output voltage reference of the slave unit resulting in an error signal at the output of the comparator. The error signal from the comparator controls the voltage across series regulator Q21, which functions as the active regulating element in the slave section.

OPERATING INSTRUCTIONS

BASIC MODE OF OPERATION

This power supply operates as a constant voltage source provided the load current does not exceed the rated value at 40° C. For continuous operation, load current must not exceed the rating for each ambient temperature. When rated load current is exceeded, both voltage and current decrease until voltage reaches zero and the current at short circuit equals approximately 40 percent or less of the rated current.

CONNECTIONS FOR OPERATION

NOTE: Make all connections to the unit before applying AC input power.

Ground Connections. The Lambda power supply can be operated either with negative, positive, or common terminal grounded. Positive, negative, and common ground connections are shown for all suggested output connections illustrated in this manual.

Connection Terminals. Make all connections to the supply at the terminals provided. Apply input power to AC terminals; always connect the ungrounded (hot) lead to terminal indicated in figures 3 and 4. The supply positive terminal is brought out to terminal +V. The supply common terminal is brought out to terminal COM. The supply negative terminal is brought out to terminal -V. Recommended wiring of the power supply to the load and selection of wiring is shown in figures 1 through 4. Selection of proper wiring is made on the basis of load requirements. Make all performance checks and measurements of current or voltage at the rear output terminals. Connect measuring devices directly to terminals or use the shortest leads possible.

SUPPLY LOAD CONNECTIONS

Connections For Operation as a Constant Voltage Source. The output impedance and regulation of the power supply at the load may change when using the supply as a constant voltage source and connecting leads of practical length are used. To minimize the effect of the output leads on these characteristics, remote sensing is used. Recommended types of supply-load connections with local or remote sensing are described in the following paragraphs.

Refer to figure 1 to determine voltage drop for particular cable length, wire size and current conditions. Lead lengths must be measured from supply terminals to load terminals as shown in figure 2.

Local Sensing Connection, Figure 3. Local sensing is the connection suitable for application with relatively constant load or for applications with short power output leads. Any load connection combination as shown in the figure can be used.

Remote Sensing Connection, Figure 4. Remote sensing provides complete compensation for the DC voltage drops in the connecting cables. Sensing leads should be a twisted pair to minimize AC pick-up. A 2.5mf elect., capacitor may be required between output terminals and sense terminals to reduce noise pick-up.

OPERATION AFTER PROTECTIVE DEVICE SHUTDOWN

Thermostat Shutdown

The thermostat opens the input circuit only when the temperature of the heat sink exceeds a maximum safe value. The thermostat will automatically reset when the temperature of the heat sink decreases to a safe operating value. After eliminating the cause(s) for overheating and allowing time for the power supply to cool to a proper temperature, resume operation of the supply.

GENERAL

This section describes trouble analysis routine, replacement procedures, calibration and test procedures that are useful for servicing the Lambda power supply. A trouble chart is provided as an aid for the troubleshooter. Refer to the section on specifications and features for the minimum performance standards.

TROUBLE ANALYSIS

Whenever trouble occurs, systematically check fuse, primary power lines, external circuit elements, and external wiring for malfunction before trouble shooting the equipment. Failures and malfunctions often can be traced to simple causes such as improper jumper and supply-load connections or fuse failure due to metal fatigue.

Use the electrical schematic diagram and block diagram, figure 6, as an aid to locating trouble causes. The schematic diagram contains various circuit voltages that are averages for normal operation. Measure these voltages using the conditions for measurement specified on the schematic diagram. Use measuring probes carefully to avoid causing short circuits and damaging circuit components.

CHECKING TRANSISTORS AND CAPACITORS

Check transistors with an instrument that has a highly limited current capability. Observe proper polarity to avoid error in measurement. The forward transistor resistance is low but never zero; backward resistance is always higher than the forward resistance.

For good transistors, the forward resistance for any junction is always greater than zero.

Do not assume trouble is eliminated when only one part is replaced. This is especially true when one transistor fails, causing other transistors to fail. Replacing only one transistor and turning power on, before checking for additional defective components could damage the replaced component.

When soldering semi-conductor devices, wherever possible, hold the lead being soldered with a pair of pliers placed between the component and the solder joint to provide an effective heat sink.

NOTE: The leakage resistance obtained from a simple resistance check of a capacitor is not always an indication of a faulty capacitor. In all cases the capacitors are shunted with resistances, some of which have low values. Only a dead short is a true indication of a shorted capacitor.

PRINTED CIRCUIT BOARD MAINTENANCE TECHNIQUES

1. If foil is intact but not covered with solder it is a good contact. Do not attempt to cover with solder.

2. Voltage measurements can be made from either side of the board. Use a needlepoint probe to penetrate to the wiring whenever a protective coating is used on the wiring. A brass probe can be soldered to an alligator clip adapted to the measuring instrument.

3. Wherever possible use a heat sink when soldering transistors.

4. Broken or damaged printed wiring is usually the result of an imperfection, strain or careless soldering. To repair small breaks, tin a short piece of hook-up wire to bridge the break, and holding the wire in place, flow solder along the length of wire so that it becomes part of the circuitry.

5. When unsoldering components from the board never pry or force loose the part; unsolder the component by using the wicking process described below:

a) Select a 3/16 inch tinned copper braid for use as a wick; if braid is not available, select AWG No. 14 or No. 16 stranded wire with 1/2 inch insulation removed.

b) Dip the wick in liquid rosin flux.

c) Place the wick onto the soldered connection and apply soldering iron onto the wick.

d) When sufficient amount of solder flows onto the wick, freeing the component simultaneously remove iron and wick.

TROUBLE CHART

The trouble chart is intended as a guide for locating trouble causes, and is used along with the schematic diagram.

The operating conditions assumed for the trouble chart are as follows:

a) AC power of proper voltage and frequency is present at input terminals.

b) Either positive, negative, or common terminal is connected to chassis ground.

e) The power supply is connected for constant voltage with local sensing. See schematic; dotted lines indicate jumpers connected for local sensing operation.

TROUBLE SHOOTING CHART

Symptom	Possible Cause	Remedy
1. Zero volts DC output, both sides.	Short circuit across output of supply.	Check load and load connections, correct as necessary.
	Q1, R7 open.	Check Q1, R7 for open, replace as necessary.
	Shorted CR6 or C4.	Check CR6 and C4 for short, replace as necessary.
	IC1 defective.	Voltage at pin 6 must measure above rated output voltage. If reading exceeds nominal voltage rating by 3 volts or if less than output voltage rating replace IC1.
2. Zero volts DC output, minus side.	Q21, R27 open.	Check Q21, R27 for open, replace as necessary.
	Short circuit across output of supply.	Check load and load connections, correct as necessary.

TROUBLE SHOOTING CHART (Cont)

Symptom	Possible Cause	Remedy
	Shorted CR26 or C24	Check CR26 and C24 for short, replace as necessary.
	IC21 defective	See "IC1 Defective".
3. Unable to adjust output voltage.	Damaged VDC ADJ. control.	Check R10 for short or open, replace as necessary
4. High ripple at twice line frequency and unregulated DC output, both sides.	Q1 shorted.	Check Q1 for short, replace as necessary.
	Jumper between terminals +V and +S open.	Refer to figures 3 and 4 for proper supply terminal connections.
	IC1 defective.	See "Symptom 1".
5. High ripple at twice line frequency and unregulated DC output, minus side.	Q21 shorted.	Check Q21 for short, replace as necessary.
	Jumper between terminals -V and -S open.	Refer to figures 3 and 4 for proper supply terminal connections.
	IC21 defective.	See "IC1 Defective".
6. High ripple at line frequency, both sides.	Defective main rectifier, plus side.	Check for open or short CR1A, CR1B.
	C1 open.	Check C1 for open, replace as necessary.
7. High ripple at line frequency, minus side.	Defective main rectifier, minus side.	Check for open or short CR21A, CR21B.
	C21 open.	Check C21 for open, replace as necessary.
8. High ripple at frequency other than line or twice line frequency	Oscillation due to defective component in filter network.	Check for open C3, C4, C23, C24, R16, and R36.
9. Regulated high output voltage, limited voltage adjust range, both sides.	Defective IC1.	See "Symptom 1".
10. Regulated high output voltage, minus side.	Defective IC21.	See "Defective IC1".

PERFORMANCE CHECKS

Check the ripple and regulation of the power supply using the test connection diagram shown in figure 7. Use suggested test equipment or equivalent to obtain accurate results. Refer to SPECIFICATIONS AND FEATURES for minimum performance standards.

Set the differential meter, DC DVM (John Fluke Model 891A or equivalent) to the selected power supply operating voltage. Check the power supply load regulation accuracy while switching from the load to no-load condition. Long load leads should be a twisted pair to minimize AC pick-up.

Use a Variac to vary the line voltage from 105—127 or 127—105 volts AC and check the power-supply line regulation accuracy on the TVM differential meter.

Use a TVM, John Fluke Model 931B or equivalent, to measure rms ripple voltage of the power supply DC output. Use oscilloscope to measure peak-to-peak ripple voltage of the power supply DC output.

Perform checks on both plus and minus sides of the power supply.

SERVICE

When additional instructions are required or repair service is desired, contact the nearest Lambda office where trained personnel and complete facilities are ready to assist you.

Please include the power supply model and serial number together with complete details of the problem. On receipt of this information, Lambda will supply service data or advise shipping for factory repair service.

All repairs not covered by the warranty will be billed at cost and an estimate forwarded for approval before work is started.

PARTS ORDERING

Standard components and special components used with the Lambda power supply can be obtained from the factory. In case of emergency, critical spare parts are available through any Lambda office.

The following information must be included when ordering parts:

1. Model number and serial number of power supply and purchase date.

2. Lambda part number.

3. Description of part together with circuit designation.

4. If part is not an electronic part, or is not listed, provide a description, function, and location of the part.

PARTS LIST

The electrical parts located on Lambda model LND-W-152 are listed here. In addition there is a separate listing of parts for the "J" option.

MODEL LND-W-152

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C1	Cap., elect., 6,500 mf -10 +100%, 25 vdc	CBS-65-163
C2	Cap., elect., 82 mf -10 +100%, 60 vdc	CBP-82-101
C3	Cap., ceramic, 0.001 mf ±20%, 1,000 vdc	CCK-10-010
C4	Cap., elect., 270 mf -10 +100%, 25 vdc	CBR-27-163
C5, C6	Cap., mylar, 0.022 mf ±10%, 200 vdc	CGL-22-001
C7 thru C20	Not assigned	
C21	Same as C1	
C22	Not assigned	
C23	Same as C3	
C24	Same as C4	
C25, C26	Same as C5	
C27	Cap., ceramic, 0.1 mf ±20%, 100 vdc	CDM-10-003
CR1	Rectifier, dual	FBL-00-139
CR2	Not assigned	
CR3	Rectifier	FBL-00-030
CR4	Rectifier, zener diode	FBM-Z105
CR5	Same as CR3	
CR6	Rectifier	FBL-00-094
CR7 thru CR20	Not assigned	
CR21	Same as CR1	
CR22, CR23	Not assigned	
CR24	Same as CR4	
CR25	Same as CR3	
CR26	Same as CR6	
IC1	Integrated circuit	FBT-00-073
IC2 thru IC20	Not assigned	
IC21	Same as IC1	
Q1	Transistor, NPN	FBN-L170
Q2 thru Q20	Not assigned	
Q21	Same as Q1	
R1	Res., ww, 2,000 ohms ±3%, 3 w	DFS-20-032
R2	Res., comp., 1,000 ohms ±10%, ½ w	DEB-1021
R3	Not assigned	
R4	Res., film, 95.3 ohms ±1%, ¼ w	DCP-95-019

*R34 Was 760 ohms, ±1% on units with serial no. prefixes A-C

MODEL LND-W-152 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R5	Res., film, 1,910 ohms ±1%, ¼ w	DCS-19-062
R6	Res., film, 348 ohms ±1%, ¼ w	DCR-35-051
R7	Res., ww, 0.15 ohm ±5%, 3 w	DFM-15-066
R8	Not assigned	
R9	Res., film, 1,000 ohms ±1%, ¼ w	DCS-10-055
R10	Res., var., cermet, 1,200 ohms ±20%, 1 w	DRS-12-015
R11, R12	Not assigned	
R13	Res., comp., 27 ohms ±5%, ½ w	DEB-2705
R14, R15	Not assigned	
R16	Res., comp., 10 ohms ±10%, ½ w	DEB-1001
R17 thru R21	Not assigned	
R22	Same as R2	
R23	Res., film, 8,870 ohms ±½%, ¼ w	
R24	Same as R4	
R25	Same as R5	
R26	Res., film, 887 ohms ±½%, ¼ w	DCR-89-094
R27	Same as R7	
R28	Same as R26	
R29	Res., film, 3,970 ohms ±½%, ¼ w	DCS-40-119
R30	Not assigned	
R31	Same as R1	
R32	Not assigned	
R33	Same as R13	
R34*	Res., film, 560 ohms ±2%, ¼ w	DCR-56-035
R35	Not assigned	
R36	Same as R16	
S1	Thermostat	FKA-132-043
T1	Transformer	ABA-LNDW-152

PARTS FOR "J" OPTION

On model LND-W-152 with suffix "J", transformer T1 changes. Part no. change for T1 is listed here.

T1	Transformer	ABA-LNDW-152J

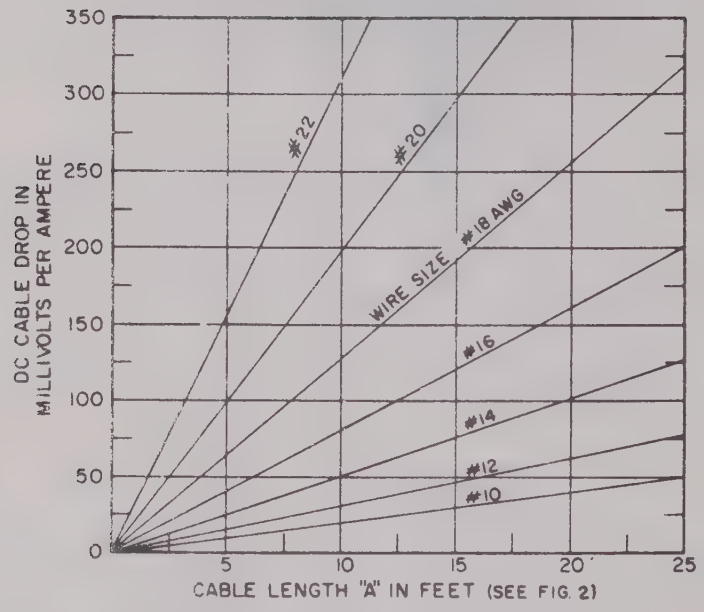


Figure 1. Cable Connection Chart

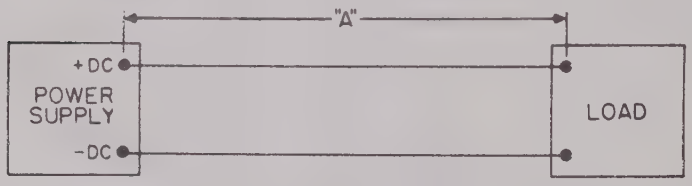
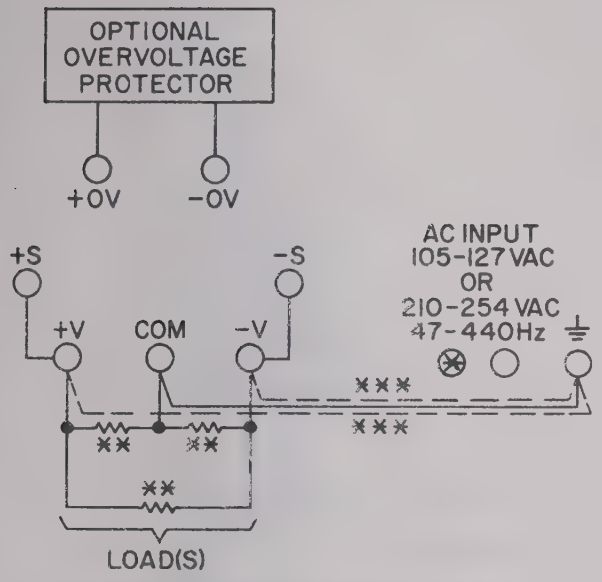


Figure 2. Cable Length "A" in Feet

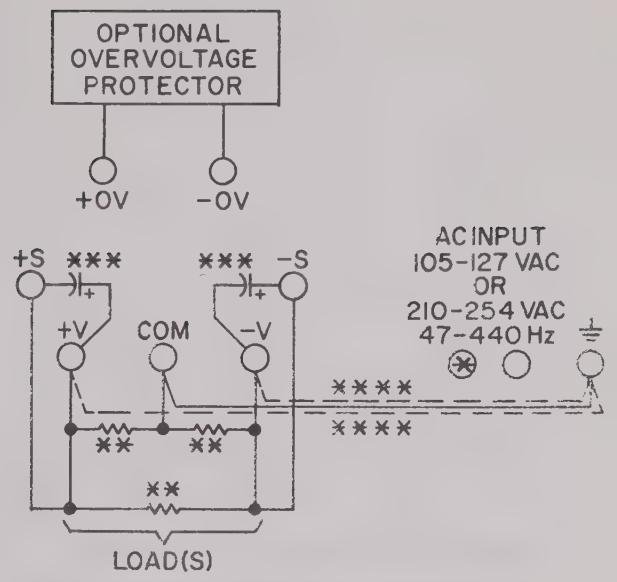


* CONNECT UNGROUNDED (HOT) LEAD TO THIS TERMINAL.

** LOAD(S) CAN BE CONNECTED IN ANY CONFIGURATION.

*** FOR POSITIVE OR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS COM & ⏚ AND RECONNECT TO TERMINALS +V & ⏚ OR -V & ⏚.

Figure 3. Local Sensing Connection.



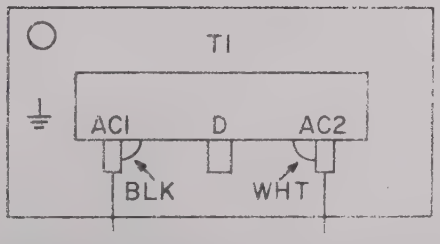
* CONNECT UNGROUNDED (HOT) LEAD TO THIS TERMINAL.

** LOAD(S) CAN BE CONNECTED IN ANY CONFIGURATION.

*** A 2.5 MF, ELECT., CAP. MAY BE REQUIRED.

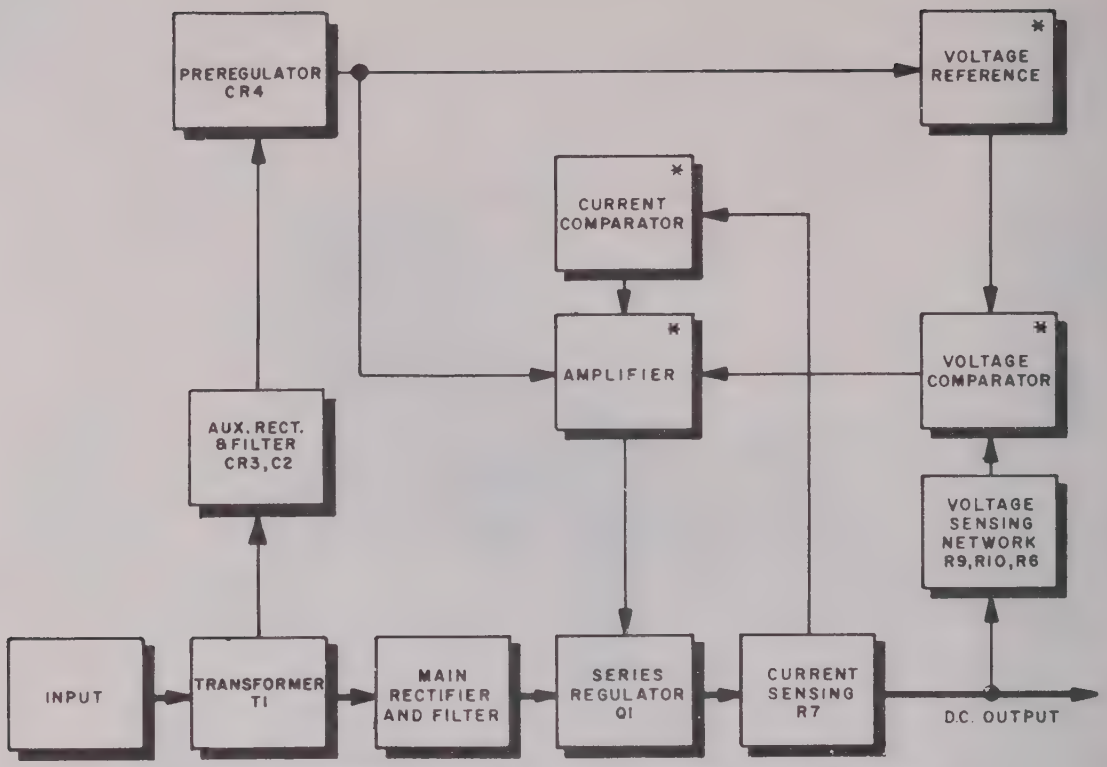
**** FOR POSITIVE OR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS COM & ⏚ AND RECONNECT TO TERMINALS +V & ⏚ OR -V & ⏚.

Figure 4. Remote Sensing Connection.



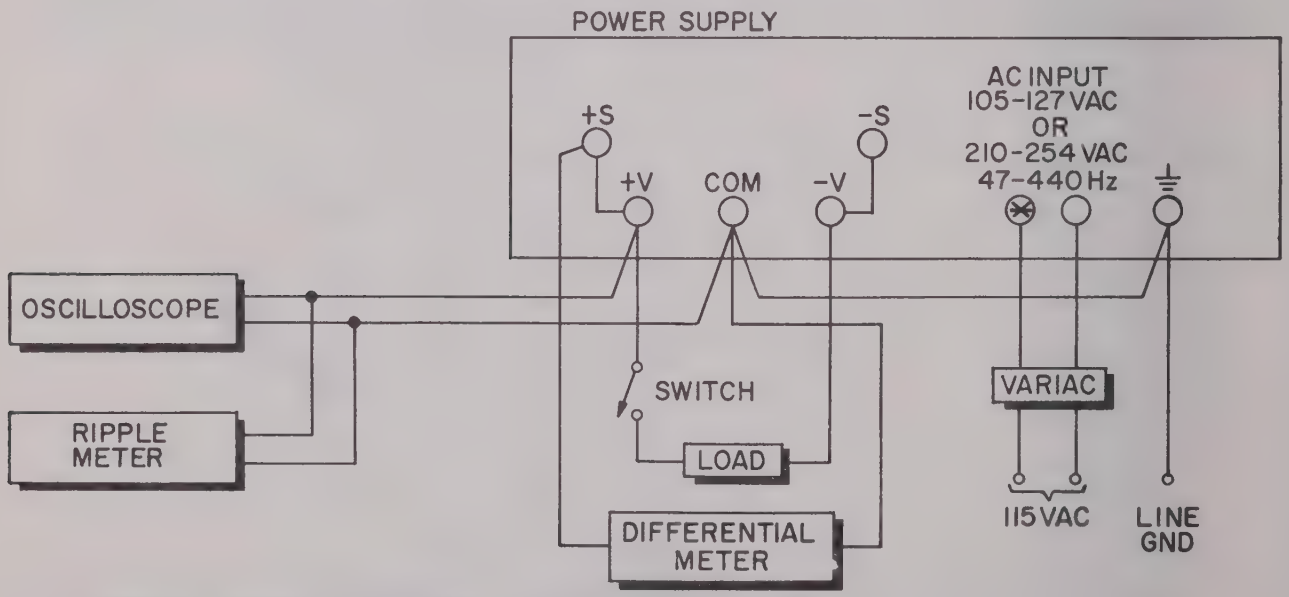
CONNECTION SHOWN IS FOR 105-127 VAC. FOR 210-254 V INPUT, DISCONNECT BLK & WHT TRANSFORMER LEADS FROM TERMINALS ACI & AC2 AND RECONNECT BOTH LEADS TO TERMINAL D.

Figure 5. Transformer Connections for AC Input Conversion.



NOTE: THIS DIAGRAM APPLIES TO (+) SIDE OF POWER SUPPLY BUT CAN BE USED FOR (−) SIDE BY SUBSTITUTING THE CORRESPONDING COMPONENT CIRCUIT DESIGNATIONS.
* THIS CIRCUIT ELEMENT IS LOCATED IN IC1.

Figure 6. Typical Block Diagram.



* CONNECT UNGROUNDED (HOT) LEAD TO THIS TERMINAL.

NOTES:

1. REGULATION AND RIPPLE CHECK METERS MUST NOT BE GROUNDED THROUGH THREE-WIRE LINE CORD TO GROUND.
2. PERFORM CHECKS WITH LOCAL SENSING CONNECTIONS ONLY.
3. THIS CONFIGURATION APPLIES TO PERFORMANCE CHECKS FOR POSITIVE OUTPUT SIDE. CONNECT OSCILLOSCOPE, RIPPLE METER, AND DIFFERENTIAL METER TO NEGATIVE OUTPUT FOR CHECKS PERFORMED ON THIS SIDE.

Figure 7. Test Connections For Performance Checks.

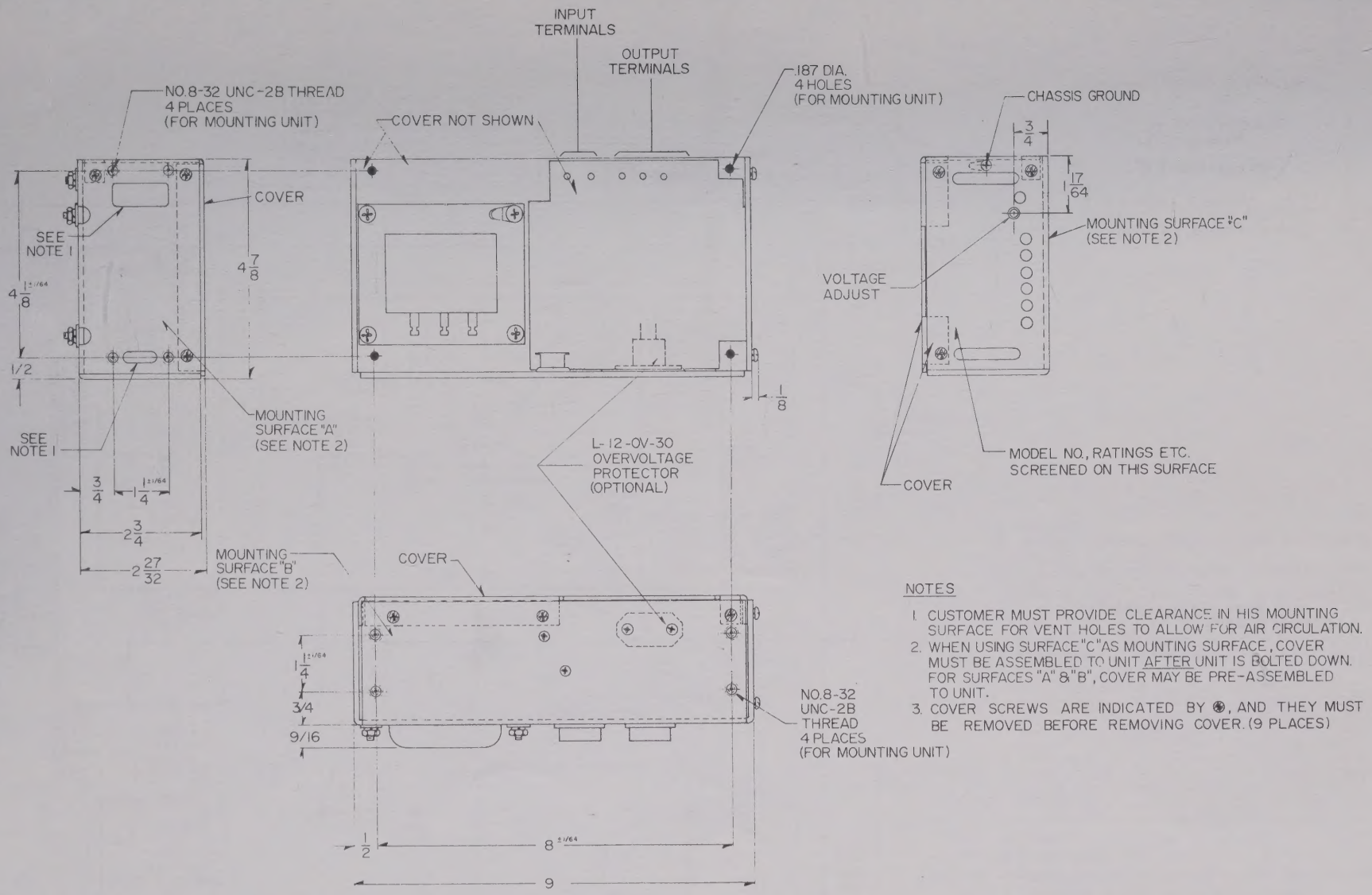
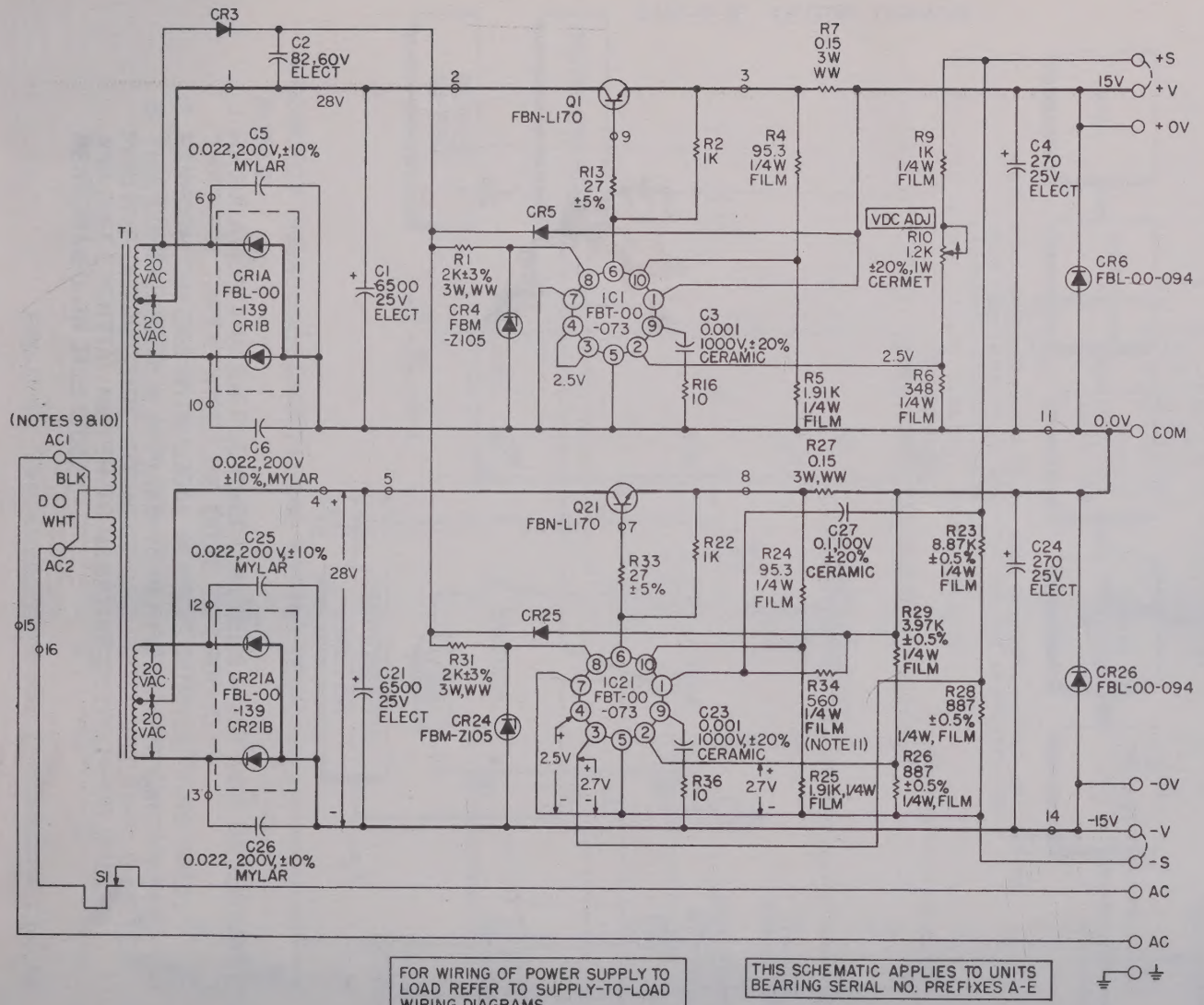

INPUT TERMINALS
OUTPUT TERMINALS
.187 DIA. 4 HOLES (FOR MOUNTING UNIT)
NO.8-32 UNC-2B THREAD 4 PLACES (FOR MOUNTING UNIT)
COVER NOT SHOWN
CHASSIS GROUND
COVER
SEE NOTE 1
MOUNTING SURFACE "C" (SEE NOTE 2)
VOLTAGE ADJUST
MOUNTING SURFACE "A" (SEE NOTE 2)
L-12-OV-30 OVERVOLTAGE PROTECTOR (OPTIONAL)
MODEL NO., RATINGS ETC. SCREENED ON THIS SURFACE
COVER
MOUNTING SURFACE "B" (SEE NOTE 2)
COVER
NO.8-32 UNC-2B THREAD 4 PLACES (FOR MOUNTING UNIT)
NOTES
1. CUSTOMER MUST PROVIDE CLEARANCE IN HIS MOUNTING SURFACE FOR VENT HOLES TO ALLOW FOR AIR CIRCULATION.
2. WHEN USING SURFACE "C" AS MOUNTING SURFACE, COVER MUST BE ASSEMBLED TO UNIT AFTER UNIT IS BOLTED DOWN. FOR SURFACES "A" & "B", COVER MAY BE PRE-ASSEMBLED TO UNIT.
3. COVER SCREWS ARE INDICATED BY ⊛, AND THEY MUST BE REMOVED BEFORE REMOVING COVER. (9 PLACES)

Figure 8. Outline Drawing.



1. RESISTORS ARE COMP. 1/2W WITH VALUE IN OHMS UNLESS OTHERWISE NOTED.
2. RESISTOR TOLERANCES: COMP. ±10%, FILM ±1% WIRE-WOUND ±5%, UNLESS OTHERWISE NOTED.
3. CAPACITOR VALUES ARE IN MICROFARADS.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10+100%.
5. DESIGNATIONS ARE LAMBDA PART NUMBERS.
6. SYMBOLS:
   - ↑ INDICATES CLOCKWISE ROTATION OF SHAFT.
   - ▶ LAMBDA PART NO. FBL-00-030; USE IN4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - —o— INDICATES TERMINAL ON PRINTED CIRCUIT BOARD.
7. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT 115 VAC, 60 Hz; OUTPUT: 15 VDC, NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN COM. AND INDICATED POINTS UNLESS OTHERWISE NOTED.
8. FOR INPUT OTHER THAN 57-63 Hz CONSULT FACTORY.
9. T1 PRIMARY CONNECTION SHOWN IS FOR 105-127 VAC INPUT. FOR 210-254 VAC INPUT: DISCONNECT BLK & WHT TRANSFORMER LEADS FROM TERMINALS AC1 & AC2. RECONNECT BOTH LEADS TO TERMINAL D.
10. "J" OPTION UNITS HAVE SINGLE T1 PRIMARY. AC INPUT IS 90-110 VAC.
11. R34 WAS 768 OHMS ±1 % ON UNITS WITH SERIAL NO. PREFIXES A-C.

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.

DOTTED CONNECTIONS SHOWN INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-E

SCHEMATIC DIAGRAM

REGULATED POWER SUPPLY
MODEL LND-W-152

LAMBDA
ELECTRONICS
MELVILLE, NEW YORK

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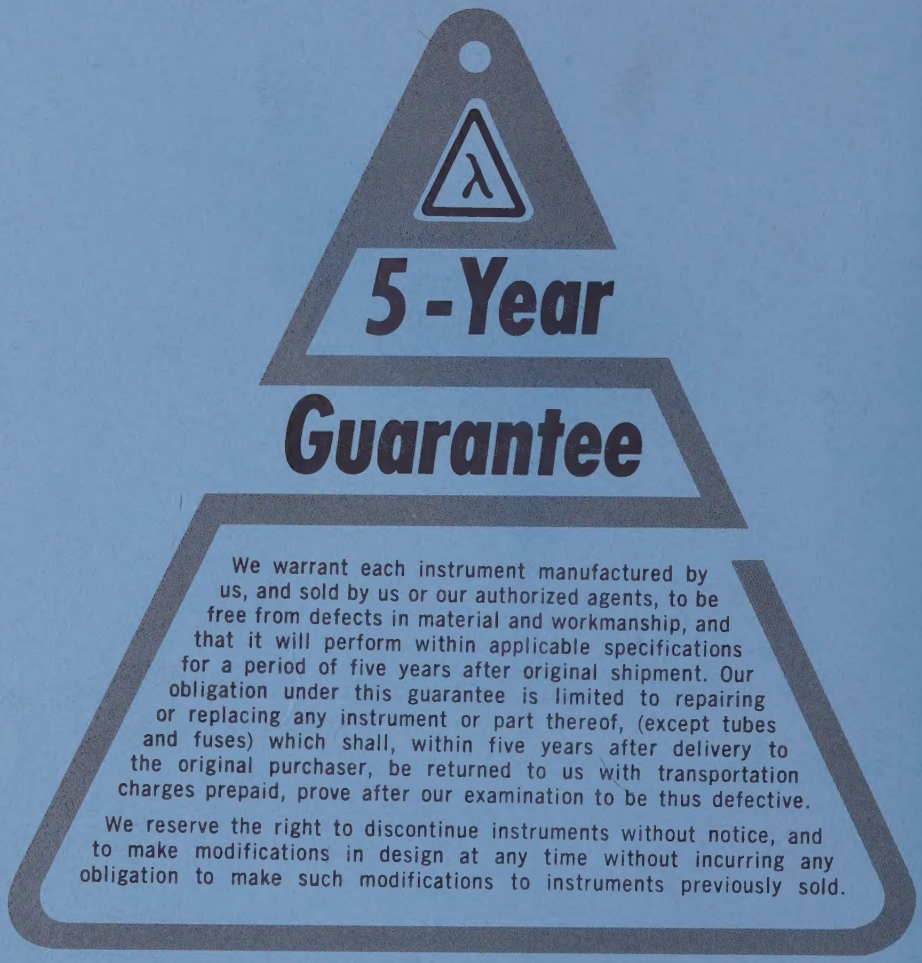
5-Year
Guarantee
We warrant each instrument manufactured by us, and sold by us or our authorized agents, to be free from defects in material and workmanship, and that it will perform within applicable specifications for a period of five years after original shipment. Our obligation under this guarantee is limited to repairing or replacing any instrument or part thereof, (except tubes and fuses) which shall, within five years after delivery to the original purchaser, be returned to us with transportation charges prepaid, prove after our examination to be thus defective.
We reserve the right to discontinue instruments without notice, and to make modifications in design at any time without incurring any obligation to make such modifications to instruments previously sold.

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